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ABSTRACT

This study was conducted to determine the effectiveness of electronic books for teaching vocabulary with and without specific supplemental vocabulary building activities. Twenty-two third grade children were divided evenly into an experimental group and a control group. Children in the control group listened as a computer read a page of the electronic book, "The New Kid on the Block: Poems by Jack Prelutsky," and viewed the animation for two target words. A researcher asked if the child knew the meaning of the word and, if not, the child viewed the animation again. The study procedure was the same in the experimental group, except that the researcher gave the child a synonym of the word if the child did not understand the word after viewing the animation a second time. Children who received supplemental vocabulary instruction in conjunction with the electronic book performed significantly better than children who used an electronic book without supplementary instruction. There was little difference in the number of times children in either group selected the target words in their search for word meaning. Four of the 11 children in the experimental group were able to define all six of the target words on the posttest, whereas none of the children in the control group were able to define all six words. (SWC)

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Final Report
Faculty Released Time Project
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Using Electronic Books to Promote Vocabulary Development

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The effectiveness of any instructional program depends upon how it is used, for what purpose it is used and with whom it is used. Members of the instructional development community have long recognized the importance that utilization plays in the development of effective instructional programs. One of the earliest definitions of instructional development refers to the "…design, production, evaluation, and utilization [italics added] of complete systems of instruction…"(AECT, 1977, p. 171). All of the models included in Gustafson and Branch's (1997) survey of instructional development models include a stage or phase devoted to product utilization or implementation. Those instructional development models that have a classroom orientation (Gerlach & Ely, 1980; Sullivan & Higgins, 1983; and Reiser & Dick, 1996) recognize the central importance of the teacher in the effective utilization of instructional programs. How teachers promote learning is, however, seldom described in specific terms. Gerlach and Ely (1980) list teacher utilization tasks such as determine a strategy, organize groups, allocate time and allocate space in their model. Sullivan and Higgins (1983) stress the importance of teachers providing appropriate information and providing individualized appropriate practice needed to obtain specific instructional objectives. Reiser and Dick (1996) describe the need to plan instructional activities that are intended to help students attain specific instructional objectives.

Nowhere is the need to specify how instructional materials should be used more obvious than with the vast amount of commercially available computer programs that are being used in schools. Take as an example, the number of electronic children's books that are being used as part of reading programs in many schools. These electronic books are derived from popular children's illustrated books, but have added many multimedia enhancements, some of which may promote reading achievement. Most electronic books can read whole stories, phrases and individual words aloud. The electronic books published by Discis Knowledge, provide pronunciation and verbal definitions for selected words and record a recall list of words selected by the reader. Another publisher of electronic books, Broderbund, has designed word animation features into their books that are intended to help children learn the meanings of unfamiliar words (Broderbund, 1998). Current research provides little guidance in how teachers or children can use these electronic book features to promote reading achievement. Few of the studies involving electronic books describe if or how the electronic book enhancements were used.

Several investigators have sought to compare the effects of electronic and print books on reading achievement (Matthew, 1997; Moore & Smith, 1996 and Standish, 1992). Matthew (1997) obtained mixed results when she compared Third Grade children's reading achievement when using electronic or print versions of the same book. She reported that children who read Discis electronic books performed significantly better on story retelling than a matched group who read printed books, but there were no differences between the two groups on a story comprehension test.

Moore and Smith (1996) compared the differences between electronic books and printed books on Fourth Grade children's performance on story comprehension tests. They reported a significant interaction between the book format and the difficulty level of the story indicating that the CD ROM format was more effective when stories were long and difficult. Standish (1992) compared the reading achievement of two unequally matched groups of Second Grade children; one group reading CD ROM books the other reading printed books. She found no differences between the two group's scores on the reading portion of the Metropolitan Achievement Test (MAT).

None of these comparison studies report the extent to which children used the electronic book features that were available to them. Even in those comparison studies that report significant differences in reading achievement favoring electronic books, no efforts were made to determine if or how the electronic features contributed to that achievement. The novelty of the electronic books is a reasonable explanation for the differences observed in each of the studies that matched groups of children reading electronic books or print books.

Miller, Blackstock and Miller (1994) used the word recall feature in Discis books to determine how often three children accessed the pronunciations and definitions of unfamiliar words in repeated readings of a story. They noted that children's selection of unfamiliar words decreased rapidly over successive readings of a story. These 'search for meaning ' miscues which numbered 18, 35, and 31 on the first reading of a story dropped rapidly to 0, 1 and 3 respectively by the fifth reading of the stories.

The authors assumed that reading performance improved due to the decrease in the rate at which the children selected unfamiliar words. Neither the children's ability to define unfamiliar words nor their ability to answer story comprehension questions were ever assessed. Clearly current research provides little or no guidance concerning how teachers can use the features of electronic books to promote achievement among young readers. Reading methods textbooks do provide guidelines for teachers to use to promote reading outcomes such as fluency, vocabulary development, comprehension and motivation. Lipson and Wixson (1996), for example, provide four guidelines for promoting vocabulary development with specific examples of things to do for each guideline. Their examples include such things a relating an unfamiliar word to a known synonym, using the unfamiliar word in a different context, and asking the reader to define the unfamiliar word in his or her own words. It remains to be seen if these guidelines can be implemented with available electronic books and if implemented, whether or not they will promote higher achievement than would be attained without their implementation.

Purpose of this Study

This study is being conducted for the purpose of determining the effectiveness of selected vocabulary building activities on the learning and retention of target vocabulary when they are used in conjunction with the animation features of electronic books. To be more specific, when a child is unable to define a target word an adult would follow three of the four vocabulary building guidelines suggested by Lipson and Wixson (1997):

. Ensuring that the child attends to the animation features associated with each target word (Watch as two locomotives crash into the man's head?")
. Providing familiar synonyms in defining the unfamiliar target words ("A locomotive is the engine that pulls the train down the track"),
. Using the target words in a different, but familiar context, ("Do the locomotives on the Long Island Rail Road look like the locomotives in the poem?")

In using the vocabulary building activities described above, the adult models a fourth guideline which involves teaching the child how to use cues, in this case word animation cues, to determine the meanings of unfamiliar words.

Methods

Participants

An intact class of 23 Third Grade children from a middle-class suburban elementary school participated in the study: 10 boys and 13 girls. One girl was absent during the time the study was conducted. The children were randomly assigned to either the control group or the experimental group. There were 6 boys and 5 girls in the control group. There were 4 boys and 7 girls in the experimental group. None of the children were familiar with The New Kid on the Block: Poems by Jack Prelutsky nor had they any prior experience reading electronic books.

Procedures

Children in the control group listened as the computer read a page from the poem. They found the two target words on each page, selected the words, then watched the related animations. The researcher asked after each word, if the animation helped them to understand the meaning of the word. If the child said yes, he or she went to the next word. If the child said, "no", the researcher directed the child to view the animation again. If the child still did not understand the meaning of the word, the researcher directed the child to go to the next target word, without further discussion. The researcher recorded the number of times the child selected each target word.

Children in the experimental group listened as the computer read a page from the poem. They found the target words on each page, selected them, then viewed the animation associated with each word. The researcher asked after each word if the child could explain the meaning of the word. If the child could not define the word, the researcher directed the child to view the animation again. If the child still could not define the word, the researcher defined the word using a synonym, then questioned the child using the word in the question. For example, if the child did not know the meaning of the word Plumbing, the researcher would say, "Plumbing is the pipes that carry water and waste in your home. Plumbing is the same thing as water pipes. Do you have plumbing in your home? Where could we see the plumbing in your house?" As with the control group, the researcher recorded the number of times the children selected the target words.

Three days after the reading session the children were tested to determine if they could define the 6 target words. The target

words were read aloud to the children, then read in the sentence from the poem. For example, "The word is Plumbing, It feels like someone is drumming on plumbing." During the test the children were told if their definitions of the target words were correct or incorrect. If a target word was not defined or was defined incorrectly, the researcher explained the meaning of the word before advancing to the next word.

Results

There was very little difference in the number of times children in either group selected the target words in their search for word meanings. The mean number of target word selections was 7.64 in the control group and 8.18 in the experimental group. The researcher assured that that the children selected each of the target words at least once. Four children in the control group and one child in the experimental group selected the target words only one time. One child in each group selected target words 11 times, which averages about two selections for each of the six words. The children's posttest performances are displayed in Table 1. The posttest scores in the control group ranged from one word correctly defined to five words correctly defined. The posttest scores in the experimental group ranged from 4 words correctly defined to 6 words correctly defined. Four of the 11 children in the experimental group were able to define all six of the target words on the posttest, whereas, none of the children in the control group was able to define all six words.

Table 1. Children's Posttest Performance by Group

Control Group			Experimental Group		
Name	Gen	Posttest	Name	Gen	Posttest
CW	M	4	NG	M	5
SM	M	3	LM	F	6
SF	F	2	JP	M	4
CB	M	3	JP	F	4
LC	F	4	JL	F	5
ND	F	2	CS	F	6
TA	F	4	GC	M	6
EC	M	1	LO	F	4
EW	F	1	RK	F	4
RM	M	3	JM	M	5
DC	M	5	KE	F	6

The mean scores and standard deviations for the two groups are displayed in Table 2. The control group had a lower mean score (2.91) and wider deviation (SD = 1.30) than the experimental group (Mean = 5.00 and SD = 0.89). Clearly the children in the experimental group who interacted with an adult during the reading of the poem learned and retained the meanings of the target words better than those who only interacted with the visual cues in the electronic book.

Table 2. Mean and Standard Deviation by Group

Control Group		Experimental Group	
	N=11		N= 11
Mean	2.91	Mean	5.00
Std Dev	1.30	Std Dev	0.89

The results of a Mann-Whitney U Test revealed that the difference between the control and experimental groups was statistically significant. The results of the analysis are displayed in Table 3. The mean ranks of the control and experimental groups were 7.05 and 15.75 respectively. The resulting value of U was 11.50, which is statistically significant at the .001 level in a two-tailed test.

Table 3. Mann-Whitney U Test

Group	Cases	Mean Rank
Control	11	7.05
Experimental	11	15.75
U = 11.50	2 Tailed P <.001	

Discussion

This study was undertaken for the purpose of determining the effectiveness of electronic books for teaching vocabulary with and without specific supplemental vocabulary building activities. The results of the study clearly indicate the value of the supplemental activities on the acquisition and retention of new vocabulary. Children who received supplemental vocabulary instruction in conjunction with an electronic book performed significantly better than children who used an electronic book without supplementary instruction. The supplementary vocabulary activities used in this study were effective, but are they practical and efficient?

The supplemental vocabulary building activities used in this study are not difficult to implement and they require no special teaching skills or knowledge. The activities can be implemented by a teacher, by a parent, or by a young adult or senior volunteer. The person providing the supplementary instruction needs to be familiar with the animation features of the target vocabulary words in the electronic book and needs to know synonyms for the target words and must be able to generate questions that require the child to relate the target words to his or her world. The conversation between the adult and the child can be quiet, unobtrusive and easily implemented along with other classroom reading activities.

The vocabulary building activities used in this study involved an adult working one on one with individual children. The efficiency of the supplemental activities could be improved if the same results could be attained when the adult worked with pairs of children or with small groups of 4 or 5 children. The size of the animation images on the screen would be a limiting factor for the size of groups viewing the program. It remains to be seen if the effectiveness of the supplemental vocabulary building activities would be affected by the number of children participating in the activities at one time.

The poems in the New Kid on the Block and the animations associated with individual words in the poems are intended to be humorous. The children's reactions to the poem I've Got and Incredible Headache and to the individual word animations were not formally assessed or recorded in this study. The lack of laughter or even smiles from the children during the reading activity was obvious to the researcher. The children's attention to task and the presence of a unknown researcher asking questions and recording their responses may have taken away from the fun that would be expected in reading the poem. Future research should take into account children's affective responses to the materials they are reading as well as their attainment of specific reading skills. Support for the joy of reading should be an important outcome associated with any other reading outcomes.

As this study demonstrates, there is much to be learned about how technology-based educational programs should be implemented in classroom settings to improve learning. Individuals in the instructional development field can help define how programs can and should be used to improve learning. They can

analyze available educational programs for their alignment with current curriculum frameworks, they can design supplemental learning activities needed to attain specific learning outcomes and they can assess the effectiveness, the efficiency and appeal of the activities they design. Learning how to use existing technology-based educational programs is an important endeavor for individuals in the instructional development field to pursue. As our knowledge of how to use technology to attain important learning outcomes increases so will support for our profession increase among our colleagues in education.

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